Communications Manual

Series 2000

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SERIES 2000 COMMUNICATIONS MANUAL.
CONTENTS.

1.0 GENERAL DESCRIPTION.

The FGH S2000 controller or P2000 programmer all have serial communications fitted as standard. This takes the form of 2 way serial asynchronous communication with a computer.
Messages consist entirely of ASCII characters and may or may not contain spaces as desired.
All messages are terminated with a carriage return, <CR>.

2-Wire EIA-485 (RS-485) or 4-Wire EIA-422-A (RS-422) serial communication standards are supported.

1.1 Specification.

1.1.1 2-Wire EIA-485 Mode (RS485)

Transmission standard:	EIA-485 (RS-485)
Data rates:	1200, 2400, 4800 and 9600 baud.
Data format:	1 start, 7 data, odd parity, 1 stop bit.
Implementation:	2 wire half duplex.
Max drivers per line:	32
Max receivers per line:	32
Max cable length:	1200 metres/3937 feet

1.1.2 4-Wire EIA-422-A Mode (RS422)

Transmission standard:	EIA-422-A (RS-422)
Data rates	1200, 2400, 4800 and 9600 baud.
Data format	1 start, 7 data, odd parity, 1 stop bit.
Implementation	4 wire half duplex.
Max drivers per line	1
Max receivers per line	10
Max cable length	1200 metres/3937 feet

2.0 CONNECTIONS.

2.1 General.

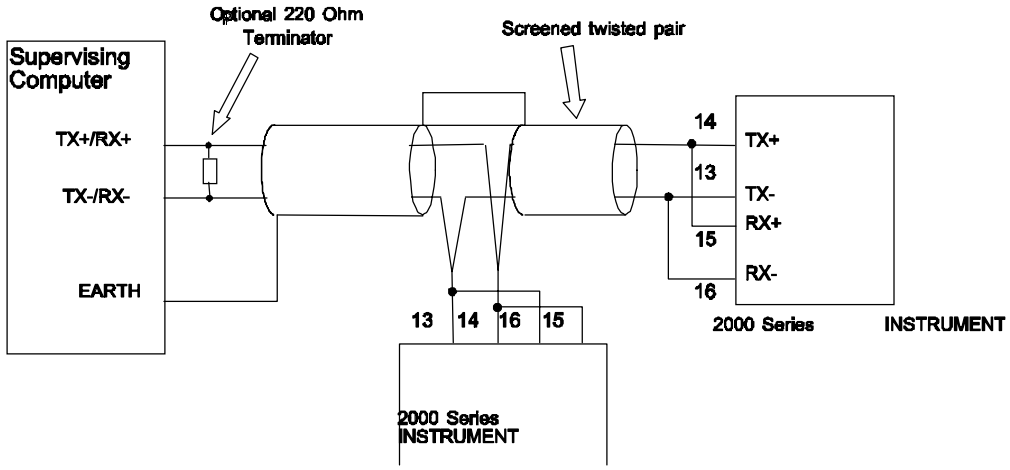
The series 2000 may be connected to any computer or device which supports the RS422 or RS485 interface standards. This includes any other communicating instruments such as the series 1000 or any other instrument using the FGH standard protocol.

The instrument uses a balanced voltage communications system which will perform well under most situations provided some simple guidelines are adhered to.

1. The communications wiring should be implemented using screened cable comprising one or two twisted pairs. The cable screen should be earthed at one point only.
2. The cable should be routed well away from sources of electrical noise such as motors, contactors and any other high voltage wiring.

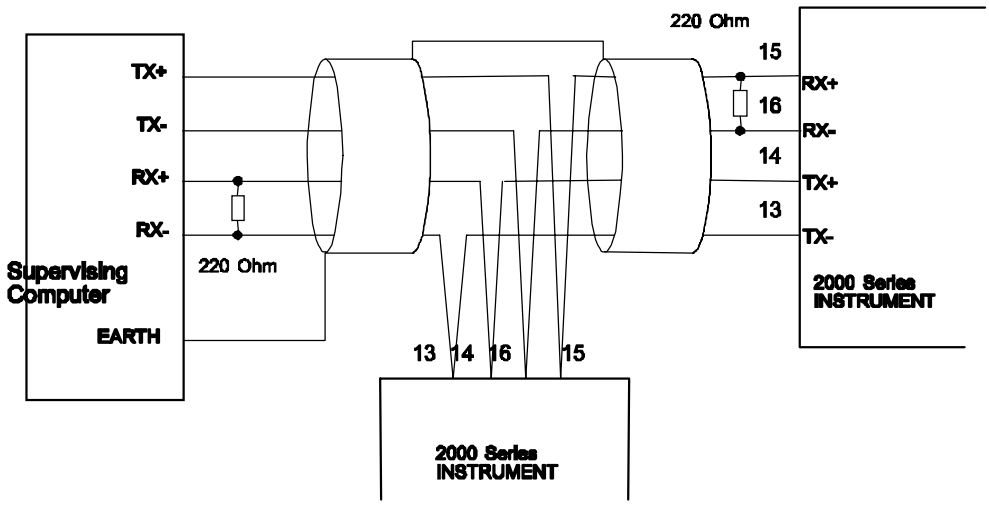
3. The network should be wired as a daisy chain, taking the wires in to one instrument and hence on to the next. Wiring spurs should be avoided. Take care to continue the cable screen on to the next instrument.
4. For long cable runs or noisy environments it may be necessary to fit a terminating resistor to the network. The terminator (a 220Ω resistor) should be fitted between RX+ and RX- on both the computer and the furthest instrument. For two wire networks this resistor should be fitted at the computer end only. Only one such resistor should be fitted on each wire pair.

2.2 2 Wire EIA-485 Mode (RS-485)



This diagram shows the connection for EIA-485 mode. Note the use of screened cable. This connection method may be continued on to other instruments up to the maximum allowed.

2.3 4-Wire EIA-422-A (RS-422)



This diagram shows the connection for EIA-422 mode. Note the use of screened cable. This connection method may be continued on to other instruments up to the maximum allowed.

2.4 Connection reference table

Instrument Terminal	Function	EIA-485	EIA-422-A
13	TX-	TX-/RX-	TX-
14	TX+	TX+/RX+	TX+
15	RX+	TX+/RX+	RX+
16	RX-	TX-/RX-	RX-
1	EARTH	N/C or SCREEN	N/C or SCREEN

2.5 Software Configuration.

Software configuration of the instrument may be performed once the instrument has been placed in 'E mode'. This is done by removing the instrument from its sleeve and setting the 'E mode' switch to ON. The instrument is then replaced in its sleeve and power re-applied. Use the scroll button (>) to scroll through elements until the **ConS** group is reached. Press the star button to access the group.

Scroll to the element **bAUd** and select the baud rate required from 1200, 2400, 4800 or 9600 using the up/down keys

Scroll to the element **AddrS**. This is the controller instrument address and may be set between 0 and 99 using the up/down keys. If the instrument is a P2000 programmer then the controller part of the instrument will have an address as set by this parameter and the programmer part of the instrument will have an address which is the controller address plus 16.

3.0 COMMUNICATIONS PROTOCOL

3.1 Message construction

Messages to and from the instrument vary in form depending on, amongst other things, the type of message and its contents. There are three basic message types:-

3.1.1 Write messages

Write messages to the instrument take the following form.

WAAPSSD..D<CR>

where **W** = write message header
AA = instrument address
P = parameter code
SS = segment number field (P2000 Only)
D..D = numeric data field

messages to the instrument may have the fields separated by spaces. These spaces will be ignored. Messages from the instrument will not contain spaces. Eg.

W 45 C 0123 <CR>

will attempt to write 123 to the local set point as well as

W45C0123<CR>

The <CR> at the end of the message is a carriage return. (Hex 0D). Each message written to the instrument must be terminated with, and each message from the instrument will be terminated with a carriage return.

3.1.2 Read messages

Read messages to the instrument take the following form.

RAAPSS<CR>

where **R** = read message header
AA = instrument address
P = parameter code to be read
SS = segment number (P2000 Only)

Again the message must be terminated with a <CR>, and spaces may be included if desired.

3.1.3 Set instrument status messages

Set messages to the instrument take the following form.

SAAC<CR>

where **S** = set message header
AA = instrument address
C = set parameter code to be performed

Again the message must be terminated with a <CR>, and spaces may be included if desired.

3.2 Message header.

This may be;

ASCII **R** signifying a Read
ASCII **W** signifying a Write
ASCII **S** signifying a Set.

The **R** header is used whenever data is being read from the instrument. When this header is used the data field is absent. The **W** header is used to write data to the instrument. The **S** header is used to set the status of the instrument.

3.3 Instrument address.

Each instrument must be given a unique address between 0 and 99. This is set when the instrument is in E mode. The address field of the message, consisting of two ASCII characters determines to which instrument the message is directed. The instrument ignores the message unless it corresponds to its own address.

For serial communications purposes, the programmer and controller parts of the instrument are treated as separate instruments. The controller part will recognise messages whose address field corresponds exactly with the address programmed in engineers mode. The programmer part will recognise the programmed address plus 16.

This fact should be borne in mind when assigning controller addresses on the network.

3.3.1 Wildcard addresses

If desired, a group of instruments can be written to together by using a wildcard character (large X) in place of one or both of the address characters. eg.

W6XC0100<CR>

would result in all instruments on that communication line with addresses of 60 to 69 having their local set point set to 100.

Instruments written to with wildcard addresses do not reply.

3.4 Message parameter code.

The parameter code field of the message is a single ASCII character. In a write message this corresponds to one of the control parameters listed in paragraph 4.6, 'parameter codes'. In the case of set messages, this is still a single ASCII character, but corresponds to one of the 'set status codes' listed in paragraph 3.7.

3.5 Segment number field (P2000 Only).

This field is used to specify the segment number reference required for some messages to the profile generator. The segment number should be a two digit field, left padded with a zero if required.

3.6 Message data field

The message data field consists of between four and eight ASCII characters and carries the data associated with the specified parameter. There are six types of data field, the type depending on the particular parameter being accessed. The parameter code tables in section 3.7 and 3.8 specify the data field format for each parameter.

3.7 Controller read/write parameter codes

Each parameter within the controller is assigned a single alpha code. The meaning of this code may vary according to the controller action type, eg. heat/cool, motorised valve etc.

Please note that some parameters use coded data fields, the code meanings are listed after the table.

Code	R/W	Parameter	Scroll Element	Data field type
@	R/W	Comms remote setpoint	-	1
A	R	Measured variable	-	1
B	R/W	Output in 0.1% Desired valve position	OP OP	1 1
C	R/W	Local setpoint	SP-L	1
D	R/W	Propband in 0.1% Ratio in 0.1%	ProP rAt	1 1
E	R/W	Integral action time in S Ratio low setpoint output limit	IAt LoOP	1 1
F	R/W	Derivative action time in S Ratio low thermal head limit	dAt tHLo	1 1
G	R/W	Derivative approach band in Xp Ratio approach band	APr bAnd	1 1
H	R/W	Heat high power limit in 0.1% Ratio high air setpoint limit	H-PL HiOP	1 1
I	R/W	Heat TP cycle time in S Ratio positive reference type	HCyC rEFH	1 1
J	R/W	Alarm 1 level	ALr1	1
K	R/W	Alarm 2 level	ALr2	1
L	R	Controller status	-	2
M	R/W	User Retransmit value	-	1
N	R	Resultant (control) setpoint	-	1
O	R/W	Setpoint type code	StyP	1
P	R/W	Alarm 1 type code	A1ty	1
Q	R	Instrument type code	-	3
R	R	Analogue remote setpoint value	-	1
S	R/W	Alarm 2 type code	A2ty	1
T	R/W	Heat low power limit in 0.1% Cool high power limit in % Ratio max thermal head	L-PL C-PL tHHi	1 1 1
U	R/W	Setpoint ramp rate in digits/hour	rAtE	1
V	R/W	Cool TP cycle time in S Valve action time in S Ratio negative reference type	CCyC VAt rEFL	1 1 1
W	R/W	Cool relative prop band in 0.1	rEL	1
X	R/W	Heat/Cool deadband in 0.1% Motor valve deadband in 0.1%	dbnd dbnd	1 1
Y	R/W	Auxiliary setpoint 1	SP1	1
Z	R/W	Auxiliary setpoint 2	SP2	1

3.8 Programmer read/write parameter codes

The table below shows the meaning of all the parameter codes available in the profile generator.

PARAMETER CODE	SS FIELD	MEANING	READ ONLY	DATA FIELD
C	N/A	Profile setpoint	YES	TYPE 1
D	N/A	Delay start time in mins	NO	TYPE 1
E	N/A	Segment Elapsed time in mins	YES	TYPE 1
H	N/A	Profile hold band in digits	NO	TYPE 1
I	N/A	Profile hold type	NO	TYPE 1 (coded)
J	N/A	Profile repeats	NO	TYPE 1
K	N/A	Number of repeats remaining	YES	TYPE 1
L	YES	Segment target level in digits	NO	TYPE 1
M	N/A	Current event status	YES	TYPE 4
N	N/A	Ready mode event status	NO	TYPE 4
P	N/A	Profile pointer	NO	TYPE 1
Q	N/A	Profile status	YES	TYPE 5
R	YES	Segment event outputs	NO	TYPE 4
T	YES	Segment time in minutes	NO	TYPE 6
X	N/A	Profile currently running	YES	TYPE 1

3.9 Controller Set status codes.

Writing a set command to the instrument with a parameter as follows will produce the specified action if the address field matches the address of the instrument. In the examples given the instrument address is assumed to be 20.

CODE	MESSAGE	REPLY	MEANING
M	S20M<CR>	*20M<CR>	Set controller to Manual mode
A	S20A<CR>	*20A<CR>	Set controller to Auto mode
P	S20P<CR>	*20P<CR>	Turn on the pretuner
T	S20T<CR>	*20T<CR>	Turn on the adaptive tuner
O	S20O<CR>	*20O<CR>	Turn off pretuner and adaptive tuner
U	S20U<CR>	*20U<CR>	Unlatch any latched alarms

3.10 Programmer Set status codes.

Programmer set commands are signified by the **S** header as they are for the controller.

There are only four set parameter codes and their meanings are given below.

CODE	MESSAGE	REPLY	MEANING
S	S36S<CR>	*36S<CR>	Start profile pointed to by profile pointer
R	S36R<CR>	*36R<CR>	Reset currently running profile
H	S36H<CR>	*36H<CR>	Holds (pauses) execution of profile
F	S36F<CR>	*36F<CR>	Frees hold allowing profile to continue

3.11 Response from read or write

The response of the instrument to a satisfactory read or write message with the correct address will be as follows (unless an address wildcard is used, see para 3.3.1):

***AAPSSD..D<CR>**

The instrument will respond with a string of ASCII characters. The header will consist of '*' (Hex 2A).

The **AA**, **P** and **SS** fields will be exactly the same as in the message which prompted the response. The **SS** field will only be present for some messages to and from the profile generator part of the instrument.

The format of the data field **D..D** is specific to the parameter code used and these field types are described in section 3.14.

3.12 Set status response

The response of the controller to a satisfactory 'set status' message with the correct address will be as follows (unless a wildcard address is used):

***AAP<CR>**

The controller will respond with a string of ASCII characters. The header will consist of '*' (Hex 2A). The header will be followed by an address (AA) showing the address of the responding instrument in ASCII, 00 to 99.

after the address is a single ASCII character showing the 'set status' mnemonic used

This is followed by a <CR> to complete the message return.

3.13 Controller error responses

Two sorts of error in a received message may be detected by the controller, these are:

3.13.1 Corrupt message response

Noise or interference during the transmission of the message causing corruption of one or more characters so that it was no longer valid. The receiver within the instrument detects this, and as long as it was not the address that was corrupted, the controller responds as follows;

?AAC<CR>

where **AA** is the address of the instrument responding
C = **P** for detected parity error
F for detected overflow error
O for detected receiver overrun

3.13.2 Syntax error response

Messages that were correctly received but don't make sense, as long as the address part was o. k. generate the following response;

?AANN<CR>

where **AA** = address of the instrument responding
NN = two digit ASCII HEX error code

Error code binary weightings:

bit7 = Illegal trailer
bit6 = Tx buffer overflow
bit5 = Illegal number of characters
bit4 = Illegal data
bit3 = Illegal parameter code
bit2 = Rx buffer overflow
bit1 = Illegal header
bit0 = Write to read only parameter

3.14 Data fields

There are six different type of data fields used on the Series 2000.

3.14.1 Data field type 1

This is the most common of the data field types and is used for simple numeric data. The data field consists of 4 numeric characters preceded by an optional minus sign.

For example to write to the local setpoint on instrument address 3.

The computer would send **W03C-0100<CR>**

The instrument would respond ***03C-0100<CR>**

Note that the data field is padded out to 4 characters in both the query and response messages.

3.14.2 Data field type 2.

This data field type is reserved for the controller status obtained by reading parameter L. The instrument will respond with:

***NNLABCD<CR>**

Where **NN** is the instrument address.

A = Digital inputs
= 0 Both off or unused
= 1 Input 1 on, 2 off or unused
= 2 Input 2 on, 1 off or unused
= 3 Both digital inputs are on.

B = alarm condition
= 0 Both alarms off
= 1 Alarm 1 on, alarm 2 off
= 2 Alarm 2 on, alarm 1 off
= 3 Both alarm 1 and 2 are on

C = Tuner status
= 0 pretune and atune are off
= 1 pretune is on, atune is off
= 2 atune is on, pretune is off
= 3 pretune and atune are on

D = Auto/Man
= 0 Automatic
= 1 Manual

3.14.3 Data field type 3

This data type is reserved for the instrument type code. The instrument type code may be read from the controller by reading parameter code Q. The controller will respond with;

***NNQABCD<CR>**

Where **A** = Input 2
= 0 Controller with remote setpoint
= 1 Controller without remote setpoint
= 3 Programmer/Controller

BC = Input type
= 00 Type S, degrees C
= 01 Type R, degrees C
= 02 Type J, degrees C
= 03 Type K, degrees C
= 04 Type T, degrees C
= 05 Type E, degrees C
= 06 Type B, degrees C

BC = Input type

= 07 Type N, degrees C
= 08 Type W, degrees C
= 09 Type W3, degrees C
= 10 Type W5, degrees C
= 11 Type NM, degrees C
= 12 Type L, degrees C
= 13 Type K10, degrees C
= 14 Type T10, degrees C
= 15 Type RT10, degrees C
= 16 Type RT, degrees C
= 17 Type S, degrees F
= 18 Type R, degrees F
= 19 Type J, degrees F
= 20 Type K, degrees F
= 21 Type T, degrees F
= 22 Type E, degrees F
= 23 Type B, degrees F
= 24 Type N, degrees F
= 25 Type W, degrees F
= 26 Type W3, degrees F
= 27 Type W5, degrees F
= 28 Type NM, degrees F
= 29 Type L, degrees F
= 30 Type K10, degrees F
= 31 Type T10, degrees F
= 32 Type RT10, degrees F
= 33 Type RT, degrees F
= 34 Type Linear
= 35 Type Root

D = Control action

= 0 None
= 1 Heat only
= 2 Heat and Cool
= 3 Motorised Valve
= 4 Ratio output

3.14.4 Data field type 4 (P2000 Only)

This data field consists of 8 data digits and is used solely for event output data. Each data digit may be either a '**1**' (signifying event ON), or '**0**' (signifying event OFF).

For example, To read the current event output status from instrument address 4.

The message **R20M<CR>**
May be answered ***20M10010000<CR>**

Indicating that events 1 and 4 are currently on and the rest are off.

3.14.5 Data field type 5 (P2000 Only)

This data field type is used for profile status only, and consists of 4 digits some of which may be alpha characters.

For example, reading the profile status of instrument address 4.

The message **R20Q<CR>**
May invoke the reply ***20QR'dy<CR>**
indicating that the programmer is in ready mode.

Or ***20Q02<CR>**
Indicates that segment 2 is currently running.

Or ***20Q03HM<CR>**
Indicates that segment 3 is running, the **H** indicates that the programmer is in hold and the **M** indicates the programmer is recovering from a mains failure.

3.14.6 Data field type 6 (P2000 Only)

This data field type is only used for parameter code T (segment time). It consists of 4 numeric data digits preceded by an optional alpha character.

For example reading the segment 12 target time from instrument address 4.
(Note the use of the SS field to specify the segment number).

The message **R20T12<CR>**
May invoke the reply ***20T124000<CR>**
Indicating that the segment time is 4000 minutes.

Or ***20T12E0000<CR>**
Indicating that the segment is programmed as an END.

Or ***20T12G0008<CR>**
Indicating that the segment is programmed as GOTO program 8.

3.15 Coded data fields.

3.15.1 Alarm type codes.

Reading and writing the controller alarm types is possible by use of parameters **P** (alarm 1) and **S** (alarm 2) where the data field of the message is coded as follows.

DATA FIELD	S2000 ALARM TYPE	P2000 ALARM TYPE
0000	HIGH ALARM	HIGH ALARM
0001	LOW ALARM	LOW ALARM
0002	INDEXED ALARM	INDEXED ALARM
0003	INDEXED HIGH ALARM	INDEXED HIGH ALARM
0004	INDEXED LOW ALARM	INDEXED LOW ALARM
0005	MANUAL ACK' RELAY	MANUAL ACK' RELAY
0006	REMOTE SP ACK' RELAY	REMOTE SP ACK' RELAY
0007	INVALID	PROGRAM RELAY
0008	INVALID	READY RELAY
0009	INVALID	UP RAMP RELAY
0010	INVALID	DOWN RAMP RELAY
0011	INVALID	SOAK RELAY

3.15.2 Setpoint type codes.

The setpoint type (parameter code **O**) is coded as follows.

DATA FIELD	SETPOINT TYPE
0000	HIGH CLAMPED SETPOINT
0001	LOW CLAMPED SETPOINT
0002	INDEXED SETPOINT
0003	REMOTE SETPOINT
0004	INTERNAL SETPOINT

3.15.3 Ratio limit reference type codes.

The ratio limit 1 reference (parameter code **I**) is coded as follows.

DATA FIELD	RATIO REFERENCE TYPE
0000	LIMIT IS OFF
0001	LOAD
0002	SETPOINT

3.15.4 Hold type codes (P2000 Only)

Programmer parameter code I (Hold type) uses coded data of the following form.

DATA FIELD	HOLD TYPE
0000	NO INTERNAL HOLD
0005	HOLD ON RAMPS, ABOVE SETPOINT ONLY
0006	HOLD ON RAMPS, BELOW SETPOINT ONLY
0007	HOLD ON RAMPS, ABOVE AND BELOW SETPOINT
0009	HOLD ON DWELLS, ABOVE SETPOINT ONLY
0010	HOLD ON DWELLS, BELOW SETPOINT ONLY
0011	HOLD ON DWELLS, ABOVE AND BELOW SETPOINT
0013	HOLD ON RAMPS & DWELLS, ABOVE SETPOINT ONLY
0014	HOLD ON RAMPS & DWELLS, BELOW SETPOINT ONLY
0015	HOLD ON RAMPS & DWELLS, ABOVE AND BELOW SETPOINT

APPENDIX A - BASIC COMMUNICATIONS PROGRAM

```
1000 REM DEMO PROGRAM FOR S2000 COMMUNICATIONS (GW-BASIC V3.23)
1010 ON ERROR GOTO 6000
1020 GOSUB 2000 'INITIALISE
1030 GOSUB 3000 'DRAW SCREEN
1040 WHILE  PAUSED=0      'Main loop
1050   KEY (7) STOP:KEY (8) STOP
1060   FOR I=1 TO MAXPRM
1070     KEY (5) STOP:KEY (6) STOP
1080     LOCATE 5+I,1
1090     GOSUB 4000        'Send read question and get answer
1100     GOSUB 5000        'Display answer
1110     KEY (5) ON:KEY (6) ON
1120   NEXT I
1130   KEY (7) ON:KEY (8) ON
1140 WEND
1150 GOTO 1040
2000 REM *****  INITIALISE  *************
2010 ON KEY (5) GOSUB 7000 : KEY (5) ON  'Write
2020 ON KEY (6) GOSUB 10000 : KEY (6) ON  'Address
2030 ON KEY (7) GOSUB 11000 : KEY (7) ON  'Pause
2040 ON KEY (8) GOSUB 12000 : KEY (8) ON  'Cont
2050 ON KEY (10) GOSUB 9000 : KEY (10) ON  'Break
2060 WHILE PRAM$(MAXPRM) <>"END"
2070   MAXPRM = MAXPRM+1
2080   READ PRAM$(MAXPRM)
2090   READ PRMCODE$(MAXPRM)
2100   READ PRMMUL(MAXPRM)
2110   READ PRMUNITS$(MAXPRM)
2120 WEND
2130 MAXPRM = MAXPRM-1
2140 OPEN "COM1:1200,O,7,1,DS0,CS0,CD0" AS #1
2150 ADDRESS$= "55"              'Initial controller address
2160 RETURN
2170 REM DATA TABLE. TEXT(18 MAX),PARAMETER LETTER,1/UNIT VALUE,UNITS
2180 DATA "MEASURED VALUE","A",1,"DEG"
2190 DATA "OUTPUT","B",10,"%"
2200 DATA "LOCAL SET POINT","C",1,"DEG"
2210 DATA "PROPBAND","D",10,"%"
2220 DATA "INT ACTION TIME","E",1,"SEC"
2230 DATA "DER ACTION TIME","F",1,"SEC"
2240 DATA "DER APPROACH BAND","G",10,"XP"
2250 DATA "END","",0,""
2260 RETURN
3000 REM *****  DRAW SCREEN  ************
3010 SCREEN 0,0:WIDTH 80
3020 CLS
3030 KEY 5,"WRITE"
3040 KEY 6,"ADDR'S"
3050 KEY 7,"PAUSE"
3060 KEY 8,"CONT"
3070 KEY 9,""
3080 KEY 10,"QUIT"
3090 LOCATE 2,24
3100 PRINT "F:G:H  S2000 SERIES   COMMS DEMO"
3110 LOCATE 4,1
3120 PRINT TAB(4)"Parameter"TAB(23)"Question"TAB(33)"Answer" TAB(52)"Result"
3130 RETURN
4000 REM *****  READ AND GET ANSWER  ***
4010 PRINT "->";
4020 TX$="R"+ADDRESS$+PRMCODE$(I)+CHR$(13)
4030 PRINT #1,TX$;
4040 GOSUB 8000                 'GET RX$
4050 RETURN
5000 REM *****  DISPLAY QUESTION AND ANSWER
5010 PRINT TAB(4) PRAM$(I);            'Text parameter title
5020 PRINT TAB(23) "R"ADDRESS$+PRMCODE$(I);"   =  ";RX$ SPACE$(5);
5030 VALUE$=RIGHT$(RX$,5)
```

```
5040 IF (LEFT$(VALUE$,1))>"-" THEN VALUE$=RIGHT$(VALUE$,4)
5050 PRINT TAB(48)" = ";
5060 IF (RX$="TIMEOUT") OR (LEFT$(RX$,1)<>"*") THEN GOTO 5090
5070 PRINT VAL(VALUE$)/PRMMUL(I);PRMUNITS$(I);"     ";
5080 GOTO 5100
5090 PRINT " ERROR"SPACE$(10);
5100 LOCATE CSRLIN,1:PRINT "   ";
5110 RETURN
6000 REM *****  ERROR HANDLER  *************
6010 GOSUB 13000                  'Position cursor
6020 PRINT "  Error Type " ERR "At line "ERL
6030 LOCATE CURY,CURX:RESUME NEXT
7000 REM *****  WRITE TO CONTROLLER  ******
7010 GOSUB 13000                   'Position cursor
7020 PRINT "Write Parameter ? ";
7030 WPRAM$=INKEY$:IF LEN(WPRAM$)=0 THEN 7030
7040 PRINT WPRAM$;
7050 LINE INPUT;"     New Data [-]NNNN ";WDAT$
7060 WTX$="W"+ADDRESS$+WPRAM$+WDAT$
7070 PRINT #1,WTX$+CHR$(13);
7080 GOSUB 8000                  'GET RESPONSE RX$
7090 PRINT "     "WTX$" = "RX$;
7100 LOCATE CURY,CURX
7110 RETURN
8000 REM *****  GET RESPONSE RX$  *****
8010 RX$="":IN$=""
8020 TIMLIMIT=300                'TIMEOUT LIMIT
8030 TIM=0:TIMOUT=0:RXEND=0
8040 WHILE (RXEND=0) AND (TIMOUT=0)
8050   WHILE NOT EOF(1)
8060     IN$=INPUT$(1,#1)
8070     IF IN$=CHR$(13) THEN RXEND=1 ELSE RX$=RX$+IN$
8080     TIM=0
8090   WEND
8100   TIM=TIM+1
8110   IF TIM>TIMLIMIT THEN TIMOUT=1
8120 WEND
8130 IF TIMOUT <>0 THEN RX$="TIMEOUT"
8140 RETURN
9000 REM *******BREAK - KEY 10 ************
9010 LOCATE 23,1:END
10000 REM *****  CHANGE ADDRESS  ***********
10010 GOSUB 13000                 'Position cursor
10020 LINE INPUT;"     New Address  NN ";ADDRESS$
10030 LOCATE CURY,CURX
10040 RETURN
11000 REM ***** PAUSE *********************
11010 GOSUB 13000                 'Position cursor
11020 PAUSED=1:PRINT " ** Paused ** "
11030 LOCATE CURY,CURX:RETURN
12000 REM ***** CONT **********************
12010 GOSUB 13000                 'Position cursor
12020 PAUSED=0:PRINT " ** Continue ** "
12030 LOCATE CURY,CURX:RETURN
13000 REM *****  TALK WITH OPERATOR  *******
13010 CURX=POS(0):CURY=CSRLIN    'Current curser posn
13020 LOCATE 22,2:PRINT STRING$(77,32):LOCATE 22,2
13030 RETURN
```